

## WHAT IS CLAIMED IS:

- 1       1.       A toothbrush assembly comprising:  
2               a toothbrush head having a bristle section coupled to a shaft, the shaft having  
3               an encased channel extending from the bristle section to a threaded end;  
4               a toothpaste chamber having a brush end for receiving the threaded end of the  
5               toothbrush head and an open plunger end; and  
6               a removable plunger assembly coupled to the plunger end and having a  
7               plunger head extending into and sealing against an inside surface of the toothpaste  
8               chamber, wherein only a surface of the plunger head is exposed to toothpaste in the  
9               toothpaste chamber as the plunger head rotates within the toothpaste chamber and  
10              moves laterally modifying a volume of the toothpaste chamber in response to rotating  
11              an exposed portion of the plunger assembly.
- 1       2.       The toothbrush assembly of claim 1, wherein the brush end of the toothpaste  
2               chamber has a circumferential slot for receiving an O-ring and a first cap feature for  
3               engaging and retaining a cap placed over the toothbrush head.
- 1       3.       The toothbrush assembly of claim 2, wherein the cap has a second cap feature  
2               for mating with the first cap feature and an inside surface of the cap seals against an  
3               O-ring disposed in the circumferential slot preventing liquid or toothpaste left in the  
4               bristles of the toothbrush head from leaking.
- 1       4.       The toothbrush assembly of claim 1 further comprising an adapter having a  
2               toothpaste tube end for coupling to and sealing against the threads of a plurality of  
3               off-the-shelf toothpaste tubes and a toothbrush end with threads mated to the brush  
4               end of the toothpaste chamber.

1       5.       The toothbrush assembly of claim 1 further comprising a flexible tube coupled  
2       to a bristle opening of the encased channel and extending to a point near a top of  
3       bristles in the bristle section.

1       6.       The toothbrush assembly of claim 1, wherein the removable plunger assembly  
2       comprises a plunger having a head end coupled to the plunger head and a shaft  
3       section with a non-circular cross-section extending from the head end to a tail end,  
4       wherein the shaft section has plunger threads disposed on directly opposing surface  
5       areas corresponding to a circular circumference intersecting and tangential to the  
6       opposing surface areas.

1       7.       The toothbrush assembly of claim 6 further comprising a nut threaded from  
2       the tail end onto the plunger threads of the shaft section to a stop corresponding to a  
3       flange on the head end, the nut engaging a stop surface on the flange determining how  
4       far the plunger assembly extends into the toothpaste chamber, wherein features of the  
5       nut engage features of the toothpaste chamber to prevent the nut from rotating relative  
6       to the toothpaste chamber.

1       8.       The toothbrush assembly of claim 7 further comprising a twist knob  
2       corresponding to the exposed portion of the plunger assembly and having a recess  
3       receiving the tail end of the plunger and coupling to the shaft section for rotating the  
4       plunger, wherein the twist knob has features for coupling the plunger assembly to the  
5       open plunger end when the plunger assembly is inserted into the open plunger end of  
6       the toothpaste chamber and wherein rotating the knob when the plunger assembly is  
7       sealed in the toothpaste chamber rotates the plunger head within the toothpaste  
8       chamber and moves the plunger head laterally within the toothpaste chamber, the  
9       plunger head operating to increase an available volume of the toothpaste chamber  
10      thus pulling a vacuum within the toothpaste chamber when moved towards the

11 plunger end of the toothpaste chamber and operating to decrease the available volume  
12 in the toothpaste chamber thus pressurizing the toothpaste chamber when moved  
13 towards the brush end of the toothpaste chamber.

- 1       9.     A toothbrush assembly comprising:  
2             a toothbrush head having a bristle section coupled to a shaft, the shaft having  
3             an encased channel extending from the bristle section to a threaded end;  
4             a toothpaste chamber having a brush end for receiving the threaded end of the  
5             toothbrush head and an open plunger end; and  
6             a removable plunger assembly coupled to the plunger end and having a  
7             plunger head extending into and sealing against an inside surface of the toothpaste  
8             chamber, wherein the only moving part of the plunger assembly that is exposed to  
9             toothpaste in the toothpaste chamber is a surface of the plunger head as the plunger  
10            head moves laterally to modify a volume of the toothpaste chamber in response to  
11            rotating an exposed portion of the plunger assembly.
- 1       10.    The toothbrush assembly of claim 9, wherein the brush end of the toothpaste  
2            chamber has a circumferential slot for receiving an O-ring and a first cap feature for  
3            engaging and retaining a cap placed over the toothbrush head.
- 1       11.    The toothbrush assembly of claim 10, wherein the cap of a second cap feature  
2            for mating with the first cap feature and an inside surface of the cap seals against an  
3            O-ring disposed in the circumferential slot preventing liquid or toothpaste left in the  
4            bristles of the toothbrush head from leaking.
- 1       12.    The toothbrush assembly of claim 9 further comprising an adapter having a  
2            toothpaste tube end for coupling to and sealing against the threads of a plurality of  
3            off-the-shelf toothpaste tubes and a toothbrush end with threads mated to brush end of  
4            the toothpaste chamber.

1       13.     The toothbrush assembly of claim 9 further comprising a flexible tube coupled  
2       to a bristle opening of the encased channel and extending to a point near a top of  
3       bristles in the bristle section.

1       14.     The toothbrush assembly of claim 9, wherein the removable plunger assembly  
2       further comprises a plunger having a head end and a tubular section extending from  
3       the head end to a tail end, wherein the plunger head is coupled to the head end and the  
4       tail end has an end extending across an opening in the tubular section and having two  
5       slots and a threaded opening.

1       15.     The toothbrush assembly of claim 14, wherein the removable plunger  
2       assembly further comprises a chamber sleeve having two arms for inserting the two  
3       slots in the plunger to prevent the plunger from rotating relative to the chamber sleeve  
4       and a shaft end with features for coupling to and retaining the chamber sleeve to the  
5       toothpaste chamber.

1       16.     The toothbrush assembly of claim 15, wherein the removable plunger further  
2       comprises a threaded shaft coupled to a twist knob, the threaded shaft having mated  
3       threads for the threaded opening of the plunger, wherein the twist knob has features  
4       for coupling to the chamber sleeve while remaining free to rotate relative to the  
5       chamber sleeve while rotating the threaded shaft and wherein rotating the twist knob  
6       when the plunger assembly is sealed in the toothpaste chamber moves the plunger  
7       head laterally within the toothpaste chamber, the plunger head operating to increase  
8       an available volume of the toothpaste chamber thus pulling a vacuum within the  
9       toothpaste chamber when moved towards the plunger end of the toothpaste chamber  
10      and operating to decrease the available volume in the toothpaste chamber thus  
11      pressurizing the toothpaste chamber when moved towards the brush end of the  
12      toothpaste chamber.

1       17.     A method comprising the steps of:  
2             providing a chamber having a plunger assembly for pulling a vacuum on a  
3       usable volume of the chamber when a plunger is moved in a first lateral direction  
4       increasing the usable volume and pressurizing the usable volume of the chamber  
5       when the plunger is moved in a second lateral direction decreasing the usable volume;  
6             coupling a first tube, with flexible side walls, containing a plastic, flowable  
7       media into an opening of the chamber when the plunger is positioned in the second  
8       lateral direction and the usable volume is decreased;  
9             moving the plunger in the first lateral direction increasing the usable volume  
10       thereby pulling a vacuum on the usable volume thus causing atmospheric pressure to  
11       collapse the first tube forcing the plastic material from the first tube into the usable  
12       volume of the chamber;  
13            removing the first tube while the plunger is biased in the first lateral direction  
14       and coupling an applicator to the opening of the chamber; and  
15            moving the plunger in the second lateral direction pressurizing the usable  
16       volume of the chamber and forcing the plastic media from the chamber to an opening  
17       to a channel in the applicator that is exposed to atmospheric pressure.

1       18.     The method of claim 17 comprising the step of:  
2             coupling a second tube, with flexible side walls that has been collapsed thus  
3       removing substantially all the atmosphere from the inside of the second tube, into the  
4       opening of the chamber when the plunger is positioned in the first lateral direction  
5       and the usable volume is increased; and  
6             moving the plunger in the second lateral direction pressurizing the usable  
7       volume of the chamber and forcing the plastic, flowable media from the chamber into  
8       the second tube thus filling the second tube.

- 1        19.     The method of claim 17, wherein the tube is a toothpaste tube and the plastic,  
2        flowable media is toothpaste.
- 1        20.     The method of claim 17, wherein the plunger is moved laterally in response to  
2        rotation of a twist knob coupled to the plunger.